

## Some Venezuelan Oligochaeta Glossoscolecidae and Octochaetidae

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### **Some Venezuelan Oligochaeta Glossoscolecidae and Octochaetidae. -**

Four species of earthworms are studied from Venezuela, State of Amazonas. Puerto Ayacucho. The Glossoscolecidae *Rhinodrilus ayacu* n. sp. and *R. cucho* n. sp. are described. The presence of the Octochaetidae *Dichogaster modiglianii* (Rosa) and *D. saliens* (Beddard) is registered.

**Key-words:** Oligochaeta - Glossoscolecidae - Octochaetidae - Venezuela - Amazonas.

## INTRODUCTION

During his ecological studies in Tropical America, Dr Maurizio G. Paoletti (Università degli Studi di Padova, Italy) collected a small number of earthworms and kindly put it at my disposal. I thank to Dr Paoletti for the possibility of this study.

The present collection has two main significances: one of agricultural value and other of zoological value. The agricultural importance is the finding of the pantropical, anthropochoric, African species *Dichogaster modiglianii* and *D. saliens* at 20 cm depth in the soil. In other sites of the Neotropical Region (see below) these species live from 0-10 cm depth; presenting an high populational density and a great digging activity which result in a great number of tortuous galleries. They live mainly in horticultural soils and they recover very well from manual or mechanical agricultural practices (Righi, 1990). Their occurrence at 20 cm depth is another evidence of their usefulness to the cultivable soils in the wet tropics.

The zoological value of this collection is to enlarge our knowledge about *Rhinodrilus*. RIGHI (1985) revised the genus *Rhinodrilus* PERRIER (1872) recognizing 37 species. Later *R. lourdesae* RIGHI (1986) and *R. timote* RIGHI (1989) were added and *R. ayacu* and *R. cucho* are described here. The resulting 41 species of *Rhinodrilus* are distributed in South America between the parallels of 11°N and 28°S, from Trinidad-Tobago to North Argentina. The Venezuelan species are *R. paradoxus*

PERRIER, 1872 (to Federal District and Carabobo and Aragua States), *R. senex* RIGHI, 1984 and *R. timote* RIGHI, 1989 (Aragua State), *R. appuni* (MICHAELSEN, 1892), *R. sieversi* (MICHAELSEN, 1895) and *R. fuenzalidae* CORDERO, 1944 (Carabobo State) and *R. ayacu* n. sp. and *R. cucho* n. sp. (Amazonas State).

## MATERIAL AND METHODS

The earthworms were collected in December 1994, in Venezuela, Amazonas State, Puerto Ayacucho (5°40'N–67°05'W) from soil cores at 20 cm depth, in the following localities: Gallery forest; Eisenberg Farm; Mahada. The studies were made by dissections, slides of microscopical pieces mounted in glicerín–water (1 : 1) and serial microscopical sections (10 µm) stained by Mallory's triple method (PANTIN 1964). The sketches were made with camera lucida. The material is deposited in the Departamento de Zoologia, Universidade de São Paulo (ZU) and in the Muséum d'histoire naturelle, Geneva (MHNG).

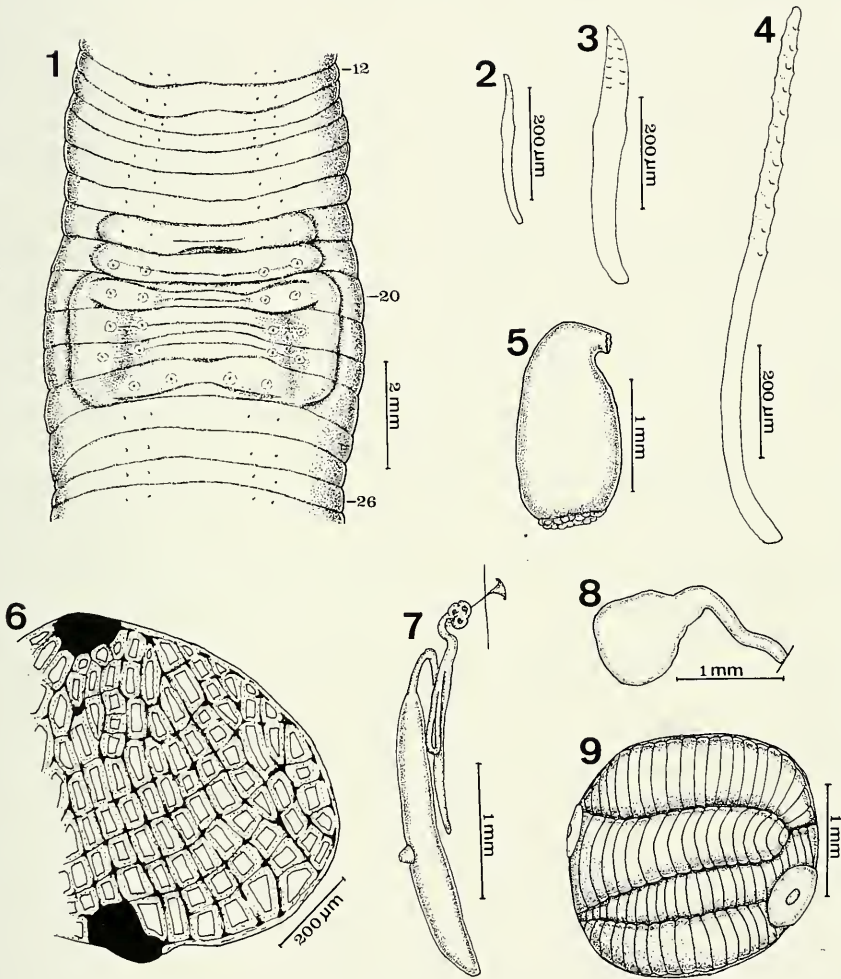
## GLOSSOSCOLECIDAE

### *Rhinodrilus ayacu* n. sp.

(Figs 1–9)

*Material:* Venezuela: Amazonas State: Puerto Ayacucho, gallery forest, 1 clitellate specimen (Holotype, ZU-1283). 1 clitellate and 2 young specimens and 1 cocoon (MHNG 20326 INVE).

*Description:* Length 80–100 mm. Mid-body diameter 4–5 mm. Number of segments 219–231. Unpigmented. The prostomium and a part of the segment I are invaginated. The segments I–II have a pair of deep nephrobuccal furrows and a lot of shallow longitudinal furrows. The other segments have smooth surface. A constricted “caudal zone”, without setae, occupies 3–4 segments beginning at CXVII–CXXI. The setae are arranged in 4 pairs of regular lengthwise arranged series starting from II. The setal relations are in the mid-body region (LXX–LXXX)  $aa : ab : bc : cd : dd = 5.5 : 1.0 : 5.5 : 0.9 : 13.3$  and in the posterior region (CCXX–CCXXX)  $= 9.1 : 1.0 : 5.3 : 1.2 : 6.0$ ;  $ab = 400$  µm in both the regions. The space *aa* increases from XX–XXII and decreases suddenly at XXIII (Fig. 1). The common setae (Figs. 2–3) are slightly sigmoid with distal nodulus. Their apical 1/6 has 4 alternate rows of semilunar excavations; there are 3–5 excavations per row. Occasionally the excavations are irregularly disposed. The length of the setae varies in the mid-body region:  $a,b = 270–309$  µm ( $M = 288$  µm) and  $c,d = 347–424$  µm ( $M = 384$  µm) and in the posterior region:  $a,b = 411–476$  µm ( $M = 445$  µm) and  $c,d = 431–476$  µm ( $M = 457$  µm). The ventral setae of IX, X–XII and XVIII–XXIII are modified as genital setae, which are straight with a slight proximal bending (Fig. 4). Their distal half has 4 alternate series of excavations. The setae of IX, X–XII and XXIII have 9–10 excavations per series and the setae of XVIII–XXII have 11–13 excavations per series. The length of the genital setae of IX–XII and XXIII varies from 604–848 µm ( $M = 735$  µm); the shorter setae are in IX, X. The setae of XVIII–XXII are 874–1054 µm ( $M = 993$  µm) long; the shorter ones are in XVIII and the longer ones in XX–XXI.



FIGS 1-9

*Rhinodrilus ayacu* n. sp.: 1 - Ventral view of the segments XII-XXVI. 2 - Mid-body setae. 3 - Posterior seta. 4 - Genital seta of XIX. 5 - Calciferous gland of IX. 6 - Cross-section of the same. 7 - Mid-body nephridium. 8 - Spermatheca of 6/7. 9 - Cocoon.

The clitellum extends on segments XV–XXV (= 11); it is ring-shaped with a little thickened ventral surface. The ventral surface of IX, X–XII is tumid and more protuberant from front to rear. Voluminous egg-shaped and medially confluent papillae contain the couples of *a*, *b* setae of XVIII, XIX and XXIII (Fig. 1). One pair of similar but does not confluent papillae may occur in XX. Setal papillae contain every *a* and *b* setae of XIX–XXIII. One pair of slightly prominent puberal ridges extends from XX–XXII (= 3 segments) or from 1/2 XX–1/2 XXIII (= 2), laterally to setae *b*. The ridges are associated with clusters of milk-white glandular cells prominent in the body cavity. Three pairs of spermathecal pores are in *cd* line of 6/7–8/9. Female pores not observable. The microscopical male pores open in 20/21 on the puberal ridges. The nephridiopores are intersegmental on *d* line.

The anterior septa resemble long interpenetrated cones. The septa 6/7–9/10 are thick and muscular; the other ones are thin and fragile. The septum 9/10 inserts dorsally in the 10/11 intersegment and ventrally in the 9/10 intersegment; the other septa have regular insertion in their own intersegments. The voluminous globular gizzard lies in VI. Three pairs of calciferous glands have ventral origin in the oesophagus and ascending position in VII–IX. The glands are pear-shaped (Fig. 5) with a wide warty ental appendix. Their structure is typically dichotomous-tubular (Fig. 6) with the small basal (central) cavity restricted to the glandular duct. The intestine begins suddenly at XVIII. There are no intestinal caeca. The typhlosolis begins at XXVII; its twisted anterior margin projects freely up to four segments forwards. In mid-body cross-section the typhlosolis is a dorsal wavy blade as high as the intestinal diameter. Three pairs of thin lateral hearts are in VII–IX and two pairs of bulky intestinal hearts are in X–XI. There is one pair of holonephridia per segment; the nephridia of VI and anterior ones are tangled at the sides of the anterior oesophagus. Each mid-body nephridium (Fig. 7) has a small pre-septal funnel and a post-septal part constituted by two loops connected to the ventral end of the bladder; the loop II extends up to the nephridiopore line and the loop I is half so long. The nephridiopore with strong sphincter is mid-lateral in the bladder.

Each pair of testis sacs coalesces ventrally in X and XI and they grow up surrounding the ventral half of the lateral hearts. There are two pairs of seminal vesicles. The first pair is small and restricted to segment XI; the second pair is band-like and reaches to XVII. Three pairs of spermathecae are in VII–IX; they become bigger from front to rear ( $1 < 2 < 3$ ). On each spermatheca (Fig. 8) the duct is so long as the flattened pear-shaped ampulla; there are not diverticulae and seminal chambers. One pair of milk-white glandular noduli is attached to the inner body wall on the line *ab* of the intersegment 5/6; the noduli are so wide as 1/3 of the first spermathecae.

The cocoon (Fig. 9) is rounded with 4.5 mm in diameter and it contains one well differentiated young. The cocoon wall is translucent light brown; the two thick circular poles without prolongations.

*Remarks:* *Rhinodrilus ayacu* has affinities to the Colombian *R. sibateensis* (Michaelsen, 1900) due to the position of the clitellum and spermathecal pores on *cd* line of 6/7–8/9 intersegments. The main characteristics to distinguish the two species are: *R. ayacu*: in the posterior body region *aa* = 9 *ab*; *bc* = 4.5 *cd* (*R. sibateensis*: in



the same region  $aa = ab$ ;  $bc = cd$ ); length of the posterior setae 411–476  $\mu\text{m}$  (length up to 800  $\mu\text{m}$ ); genital setae ornamented with 9–13 excavations per series (5 excavations per series).

The name of the new species derives from Puerto Ayacucho where it was collected.

**Rhinodrillus cucho n. sp.**

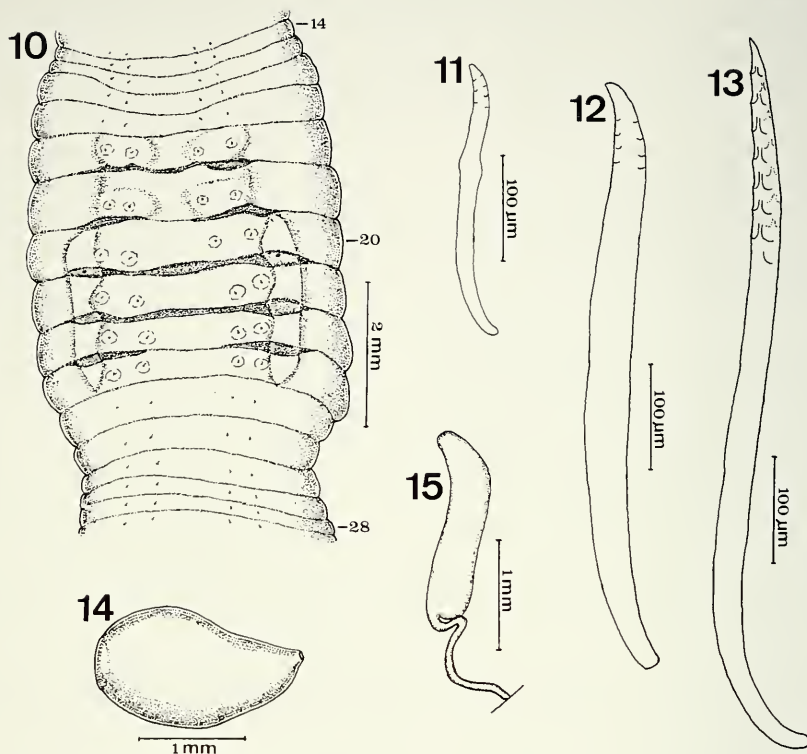
(Figs 10–15)

*Material:* Venezuela: Amazonas State: Puerto Ayacucho, gallery forest, 1 clitellate specimen (Holotype ZU-1284A), 3 clitellate and 1 mature acitellate specimens (ZU-1284B; MHNG 20327 INVE).

*Description:* Length 56–70 mm. Mid-body diameter 3.1–3.5 mm. Number of segments 199–226. The prostomium and a part of the I segment are invaginated. Unpigmented. A constricted ‘caudal zone’ occupies three segments beginning at segment CXXIX–CXXXIV. The setae are four pairs per segment starting from II. The setae *a* and *d* are disposed on regular lengthwise series and the setae *b* and *c* are irregularly disposed in the posterior 1/4–1/5 of the body. The setae *b* lose their regular arrangement from CXXIII–CLIII and the setae *c* from CLXIV–CLXVII. The relations among the setae in the mid-body region (LXX–LXXX) are  $aa : ab : bc : cd : dd = 3.0 : 1.0 : 3.4 : 0.6 : 9.0$  ( $ab = 400 \mu\text{m}$ ). The common setae are slightly sigmoid; their distal 1/7 has semilunar excavations irregularly disposed or arranged in 4 alternate series of 3–4 excavations on each one. The setae of the mid-body (Fig. 11) have a distal nodulus and their length varies: the ventral ones from 264–283  $\mu\text{m}$  ( $M = 273 \mu\text{m}$ ) and the lateral ones from 347–399  $\mu\text{m}$  ( $M = 376 \mu\text{m}$ ). The posterior setae (Fig. 12) are much bigger, without nodulus, and there are no significant differences in length among the ventral and lateral ones, which vary from 527–630  $\mu\text{m}$  ( $M = 589 \mu\text{m}$ ). The ventral setae of XVIII–XXIII are modified as genital setae. They are slightly sigmoid with the proximal bending a little bigger than the distal one (Fig. 13). Their distal third presents 4 lengthwise series of excavations. Each two series are disposed side by side and alternately with the other two series; sometimes the 4 series alternate among themselves. The number of excavations per series is 6–9. The genital setae's length varies from 540–726  $\mu\text{m}$  ( $M = 608 \mu\text{m}$ ).

The clitellum extends from XVI–XXVI (= 11 segments); it is ring-shaped opened ventrally by the male genital field in XVIII–XXIII. One pair of a little thick puberal ridges (Fig. 10) lies laterally to the setae *b* from 1/2 XX–1/2 XXIII (= 3 segments) or XX–XXIII (= 4). Two pairs of puberal papillae contain the couples of ventral setae in XVIII and XIX. The ridges and papillae are milk-white. Wide setal papillae contain every ventral setae of XVIII–XXIII. The ventral face of X–XII is tumid. The pair of microscopical male pores is on the puberal ridges in 20/21. The female pores are unrecognisable. Three pairs of spermathecal pores are on line *cd* of 6/7–8/9. The nephridiopores are intersegmental on line *cd*.

The septa 6/7–9/10 are thick and muscular; the other ones are thin and fragile. All septa have regular insertion in their corresponding intersegments. The gizzard is rounded, voluminous and very muscular in VI. Three pairs of calciferous glands depart ventrally from the oesophagus in VII–IX. Each calciferous gland (fig. 14) is



FIGS 10-15

*Rhinodrilus cucho* n. sp.: 10 - Ventral view of the segments XIV-XXV. 11 - Mid-body seta. 12 - Posterior seta. 13 - Genital seta of XIX. 14 - Calciferous gland of VIII. 15 - Spermatheca of 6/7.

pear-shaped with badly differentiated ental appendix and dichotomous-tubular structure. The origin of the intestine and typhlosolis are not recognizable due to maceration. In cross-section of the mid-body the typhlosolis is a dorsal sigmoid blade as high as the intestinal diameter. There are no intestinal caeca. Three pairs of thin lateral hearts are in VII-IX and two pairs of voluminous intestinal hearts are in X-XI. There is a pair of holonephridia per segment. The nephridia are similar to those of *Rhinodrilus ayacu*, differing by the major length of the loop II.

The testis sacs are perioesophageal in X and XI, surrounding the intestinal hearts and the seminal vesicles of XI. The second pair of seminal vesicles is a little bigger; it attains to segment XIX by piercing the interpenetrated conical septa. Ovaries not observed. The three pairs of spermathecae are in VII-IX; they are similar and become bigger from front to rear ( $1 < 2 < 3$ ). On each spermatheca (Fig. 15) the thin contort duct is as long as the ribbon-shaped ampulla. The transition duct-ampulla

is well demarcated; there are not diverticles or seminal chambers. The ampulla and duct are full of spermatozoa. Two pairs of milk-white pluricellular glands with a thin connective-muscular coat are in VI and IX attached to the inner body wall close to the 6/7 and 9/10 septa, in *ab* line. The glands of VI are rounded, their diameter is half so long as the 6/7 spermathecae. The glands of IX are oblong and three times bigger than those of VI.

*Remarks:* *Rhinodrilus cucho* is near to the Venezuelan *R. fuenzalidae* Cordero (1944) and *R. corderoi* Righi (1985) due to the remarkable arrangement of the posterior setae and similar position of the spermathecal pores. The characteristics of these species to distinguish them from *R. cucho* are: *R. fuenzalidae* — In the posterior body region the setae *a*, *c* and *d* are on regular lengthwise rows, and setae *b* are on two alternate rows. The posterior setae are not ornamented and they measure up to 1.575 x 0.15 mm. The clitellum is on 1/2 XVI, XVII–XXIV. There are pairs of papillae in VII–IX and XI–XVI. The spermathecae are of similar length; the long spiraled duct is well separated from the discoidal ampulla. *R. corderoi* — In the posterior region the setae *a* are on regular lengthwise rows and the setae *b*, *c* and *d* are irregularly disposed. The clitellum is on XVI, XVII–XXIV. The spermathecae have sack-like ampulla almost two times longer than the corresponding duct.

The name of the new species derives from the name of its type locality.

#### OCTOCHAETIDAE

##### **Dichogaster modiglianii** (Rosa, 1896)

*Benhamia modiglianii* ROSA, 1896: 510, pl. 1, fig. 1a–b.

*Dichogaster modiglianii*: RIGHI, 1990: 81, figs 152–154.

*Material:* Venezuela: Amazonas State: Puerto Ayacucho, Eisenberg Farm, 1 clitellate specimen (MHNG 20328 INVE).

*Distribution:* Peregrine species; in the Neotropical Region it is known to Mexico, Costa Rica, Panama, Colombia, Peru, Venezuela (Cojedes State: Tinaco; Amazonas State: Puerto Ayacucho), French Guyana and Brasil.

##### **Dichogaster saliens** (Beddard, 1892)

*Microdrilus saliens* BEDDARD, 1892: 683, pl. 46, figs 8, 13.

*Dichogaster saliens*: RIGHI, 1990: 82, figs 155–158.

*Material:* Venezuela: Amazonas State: Puerto Ayacucho, Eisenberg Farm, 1 clitellate and 1 acitellate specimens (ZU-1285). Puerto Ayacucho, Mahada, 2 clitellate specimens (MHNG 20329 INVE).

*Distribution:* Peregrine species, in the Neotropical Region it is known to El Salvador, Costa Rica, Panama, Argentina and Brasil.

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